THE ELECTRICAL WORLD

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Opening of the International Electrical Exhibition.

In accordance with the plans laid down and announcements made, the International Electrical Exhibition, at Philadelphia, under the auspices of the Franklin Institute, opened at noon on the 2d inst. The inaugural exercises were begun in the lecture room, forming part of the annex in the old depot of the Pennsylvania Railroad Company. The room was beautifully decorated with flags, flowers, shields, etc., and was filled to overflowing with an audience made up of members of the city government, heads of the several departments, boards and commissions, members of the American Institute of Electrical Engineers, the Institute of Mining Engineers, the American Association for the Advancement of Science and other learned societies, and a number of ladies and gentlemen specially invited by the Institute. Seated upon the platform, as the clock struck 12, were: His Excellency Governor Pattison, of Pennsylvania; Mayor Smith, of Philadelphia; President Gates, of the Select Council of the city; General Huidekoper, Postmaster of Philadelphia; William P. Tatham, President of the Franklin Institute; Col. C. H. Banes, Director-General of the Exhibition; Hon. Geo. H. Boker, Master of the Ceremonies; Prof. Houston, Electrician of the Exhibition; F. Graeff, a Vice-President of the Institute; Dr. W. H. Wahl, Congressman C. O'Neill and many other notabilities.

Hon. George H. Boker President of the Union League, approached the front of the platform and said: "To me has been assigned the duty of opening the exercises by introducing his Honor, Mayor Smith, who will welcome the guests on behalf of the city."

Mayor Smith, on rising, was greeted with applause. He said:

The honor of welcoming so large and distinguished an array of visitors to the opening of the International Electrical Exhibition has been, by the courtesy of the management, assigned to my hands, and I most heartily accept the duty, involving as it does, so much that is honorable to the city in having the good fortune to have in our midst so many distinguished men, whose lives and studies have been devoted to the study and practice of what may yet be considered wonderful, as its scope has already been displayed, a science yet in its infancy, capable of untold power and undefined adaptability. The present exhibition, vast in its proportions, great in its opportunities for the education of our people, and most liberally and successfully inaugurated by its patrons, the "Franklin Institute of Philadelphia," illustrates in its magnificence the advancement of the science and its growing importance in the mind of the scientist and the uses of the people.

The active, patient and successful experiments of our renowned townsman, Benjamin Franklin, who, one hundred and thirty-two years ago, discovered the identity of the electric current, have advanced the great agent which to-day interests the entire globe, and gathers in this building those whom we honor and esteem, not alone for their high scientific attainments, but also as the monitors of those great comforts and advantages which will in the future bear such close relations to their names. To merely say that the city of Philadelphia welcomes you here would barely express the pleasure that is felt in your presence. With a sincere, hearty and generous greeting she extends the hand of friendship, and tenders to you that cordial welcome which she trusts may make all who are within her limits feel the sincerity of her good wishes. As the electric girdle encompasses, and practically removes the distance between, nations and hemispheres, so may the spark of fraternity and peace spring from this meeting, and may the future prosperity of the ages at least find in the efforts now about being inaugurated that which will prove the wisdom of the originators of the present great enterprise.

Permit me, therefore, to welcome you all, and to wish you a pleasant sojourn here and a safe return to your homes, with naught but pleasant memories of this event.

As soon as the Mayor's address of welcome had been delivered, a procession was formed in the lecture room, and the whole assemblage, headed by the press and the gentlemen named above, marched over the bridge from the annex to the main exhibition, where not less than 7,000 or 8,000 people had gathered, meanwhile. The procession filed into the gallery on the Lancaster avenue side, and the exercises were resumed as soon as quiet had been obtained, with the following prayer from the Rev. Dr. J. S. McIntosh:

Oh, Thou who art high, in whom there is no darkness; oh, Thou who dwellest in the light, who makest the fires Thy ministers, and sendest Thy lightning forth to the end of the world, graciously behold Thy servants now assembled, and bestow upon us the light of Thy countenance, Almighty Creator, who upholdest the world of Thy power. We bless Thee for Thy wide and varied earth, sky and sea. We thank Thee for the rich stores Thou hast therein laid up for the use of man. We thank Thee for all Thou has given to us of wisdom, patience and skill to draw out the properties of matter and those riches of the earth. We thank Thee for the generation of busy and devoted toilers who have labored for their fellows, and we bless Thee for their victories and for the martyrs of science; and now, most wise and gracious God, we pray Thee to smile on this laudable undertaking; make it eminently useful in the advancement of science, the increase of knowledge, the expansion of human power, the lightening of labor and the enlargement of man's comfort and the help of distressed bodies and minds. Preserve these buildings from fire and all men herein employed from accident. All these blessings with the pardon of our sins we ask in the name of Him who taught us to say: "Our Father which art in heaven."

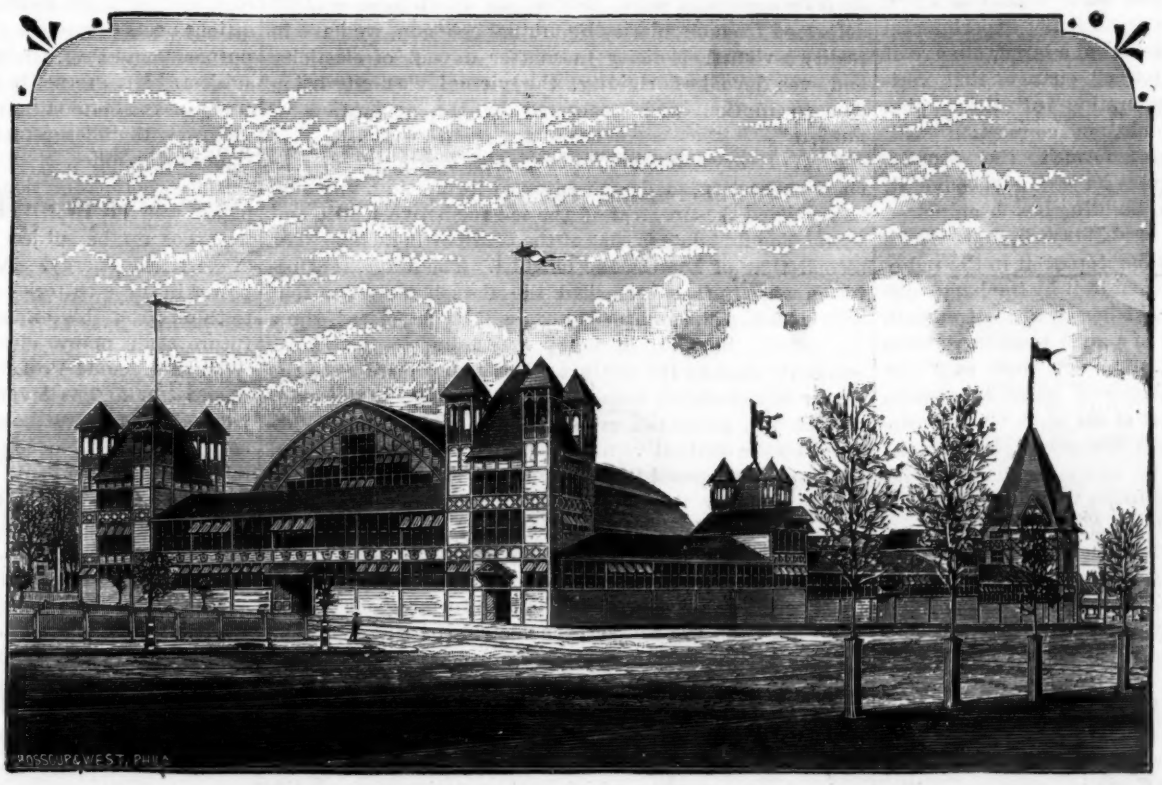
Many of the audience then followed Dr. McIntosh in the Lord's Prayer.

After Dr. McIntosh had concluded, Hon. George H. Boker made a brief speech, in which he said the Exposition represented the most advanced meeting of scientists in the world. He then introduced President Tatham, who said:

When our first parents were in the Garden of Eden they received the primeval command to increase and multiply, to replenish the earth and subdue it. After the fall mankind could do little to subdue the earth by their unaided strength, and even after subjecting the lower animals to their service, their life was merely a precarious struggle for existence.

When, however, in process of time, through the increase of their knowledge, they were able to avail themselves of the forces that exist in the other elements, they made some progress in subduing the earth. When they called in the aid of fire to extract metals from the ores, and of water to furnish them with mechanical power and to float their ships, and of air to drive their sails, their general course was advancing, but their progress was not assured and was liable to reversals. But, after they had been able to combine the forces which exist in fire and water, and to avail themselves of the magnificent energy of steam, the progress of the race became assured, steady, and comparatively rapid.

During all this time there was a force pervading all nature which was little understood and of which no use was made. In the early ages of Greece, it was observed that a piece of amber upon being rubbed acquired the power of attracting light substances, and this attractive force was called electricity. Subsequently it was found that other substances besides amber acquired the same power by friction, and in process of time machines were invented by which the force thus created could be separated from its original sources and collected together. Its properties were examined, its attractions and repulsions weighed and measured, and its methods of discharge observed.



THE INTERNATIONAL ELECTRICAL EXHIBITION, PHILADELPHIA, OPENED SEPT. 2, 1884.

These methods of discharge one hundred years ago formed the principal attractions of our lecture-rooms. I will notice two of them particularly: the disruptive discharge exhibited by the spark and shock attending it, and the convective discharge exemplified by the motion of pith balls between two horizontal plates. The balls receive a charge from the lower plate, and being repelled thereby, convey the charge to the upper plate, where they discharge themselves and fall back again to take up a fresh load.

It was near the spot where we now stand, about 130 years ago, that Dr. Benjamin Franklin raised his kite to the clouds and drew down their fire on the string. He examined its properties, and found them to be identical with those of the electricity of his laboratory, and proved that the disruptive discharge of the lecture-room was exemplified on a large scale in nature by the lightning and thunder; and it was here in Philadelphia, about fifty years ago, that Dr. Robert Hare taught us that the convective discharge of the lecture-room, had also its example in nature on a magnificent scale, in which the air, mingled with the vapor of water, acted the part of the pith ball, and conveyed the electricity from the earth to the upper regions of the atmosphere; that this convective discharge of electricity from the earth produced an ascending column of air, which successively caused the low barometer, the inblowing of the winds, the vortex and the whirlwind.

We have thus traced electricity from the slight influence exerted by rubbed amber to the lightning and the whirlwind; those wild and mighty powers which, from the beginning, by saint, by savage and by sage, by poet and by prophet, have been recognized as marking the visible presence of God!

Witness the thunder and lightning of Sinai when the law was delivered to Moses. Witness the voice by which God answered Job out of the whirlwind. Witness the thunderbolt of Jupiter which clothed his arm with in-

(*Continued on page 77.*)

The British Association Meeting at Montreal—II.

In our issue of last week we gave an account of the opening of the meetings of the British Association for the Advancement of Science, at Montreal, including the speech of Sir William Thomson and copious extracts from the address of the President, Lord Rayleigh. On the 28th the Association settled down to its regular work in the various sections.

Sir William Thomson, President of the Mathematical and Physical Section, delivered an address entitled "Steps Toward a Kinetic Theory of Matter." He began by remarking that "the now well-known kinetic theory of gases is a step so important in the way of explaining seemingly static properties of matter by motion that it is scarcely possible to help anticipating in idea the arrival at a complete theory of matter, in which all its properties will be seen to be merely attributes of motion. If we are to look for the origin of this idea we must go back to Democritus, Epicurus and Lucretius. We may then, I believe, without missing a step, skip 1,800 years. Early last century we find in Malebranche's 'Recherche de la Verité' the statement that 'La dureté des corps' depends on 'petits tourbillons.' These words, embedded in a hopeless mass of unintelligible statements of the physical, metaphysical and theological philosophies of the day, and unsupported by any explanation, elucidation or illustration throughout the rest of the three volumes, and only marred by any other single sentence or word to be found in the great book, still do express a distinct conception, which forms a most remarkable step toward the kinetic theory of matter.

"A little later we have Daniel Bernoulli's promulgation of what we now accept as a surest article of scientific faith—the kinetic theory of gases. He, so far as I know, thought only of the Boyle's and Marriot's law of the 'spring of air,' as Boyle called it, without reference to temperature or the augmentation of its pressure if not allowed to expand for elevation of temperature, a phenomenon which, perhaps, he scarcely knew, still less the elevation of temperature produced by compression, and the lowering of temperature by dilatation, and the consequent necessity of waiting for a fraction of a second or a few seconds of time (with apparatus of ordinary experimental magnitude) to see a subsidence from a larger change of pressure down to the amount of change that verifies Boyle's law. The consideration of these phenomena 40 years ago by Joule, in connection with Bernoulli's original conception, formed the foundation of the kinetic theory of gases as we now have it. But what a splendid and useful building has been placed on this foundation by Clausius and Maxwell, and what a beautiful ornament we see on the top of it in the radiometer of Crookes, securely attached to it by the happy discovery of Tait and Dewar, that the length of the free path of the residual molecules of air in a good modern vacuum may amount to several inches. * * * Rich as it is in practical results, the kinetic theory of gases, as hitherto developed, stops absolutely short at the atom or molecule, and gives not even a suggestion toward explaining the properties in virtue of which the atoms or molecules influence one another. * * * Joule, Clausius and Maxwell, and no doubt Daniel Bernoulli himself, and I believe every one who has hitherto written or done anything very explicit in the kinetic theory of gases, has taken the mutual action of the molecules in collision as repulsive. May it not after all be attractive? This idea has never left my mind since I first read Davy's 'Repulsive Motion,' about 35 years ago, but I never made anything of it, at all events have not done so until to-day (June 16, 1884) if this can be said to be making anything of it—when, in endeavoring to prepare the present address, I notice that Joule's and my own old experiments on the thermal effects of gases expanding from a high-pressure vessel through a porous plug prove the less dense gas to have greater intrinsic potential energy than the denser gas, if we assume the ordinary hypothesis regarding the temperature of a gas, according to which two gases are of equal temperatures when the kinetic energies of their constituent molecules are of equal average amounts per molecule.

"The collisional forces between the molecules of gas might be repulsive, as generally supposed hitherto, and yet attraction might predominate in the whole reckoning of differences between the intrinsic potential energies of the more dense and less dense multitudes. To explain the elasticity of a gas was the primary object of the kinetic theory of gases. This object is only attainable by the assumption of an elasticity more complex in character and more difficult of explanation than the elasticity of gases—the elasticity of a solid. Thus," continued the speaker, "even if the fatal fault in the theory to which I have alluded did not exist, and if we could be perfectly satisfied with the kinetic theory of gases founded on the collisions of elastic solid molecules, there would still be beyond it a grander theory which need not be considered a chimerical object of scientific ambition—to explain the elasticity of solids. But we may be stopped when we commence to look in the direction of such a theory, with the cynical question: What do you mean by explaining a property of matter? As to being stopped by any such question, all I can say is that if engineering were to be all and to end all physical science, we should perforce be content with merely finding properties of matter by observation and using them for practical purposes. But I am sure very few, if any, engineers are practically satisfied with so narrow a view of their noble profession. They must and do patiently observe, and discover by observation, properties of matter and results of material combinations.

"But deeper questions are always present and always fraught with interest to the true engineer, and he will be the last to give weight to any other objection to any attempt to see below the surface of things than the practical question, Is it likely to prove wholly futile? But now, instead of imagining the question, What do you mean by explaining a property of matter? to be put cynically. and letting ourselves be irritated by it, suppose we give to the questioner credit for being sympathetic, and condescend to try and answer his question. We find it not very easy to do so. All the properties of matter are so connected that we can scarcely imagine one thoroughly explained without our seeing its relation to all the others, without, in fact, having the explanation of all, and till we have this we cannot tell what we mean by 'explaining a property' or 'explaining the properties' of matter. But, though this consummation may never be reached by man, the progress of science may be, I believe will be, step by step toward it, on many different roads converging toward it from all sides. The kinetic theory of gases is, as I have said, a true step on one of the roads. * * * To return to elasticity: If we could make out of matter devoid of elasticity a combined system of relatively moving parts which, in virtue of motion, has the essential characteristics of an elastic body, this would surely be, if not positively a step in the kinetic theory of matter, at least a finger post pointing a way which we may hope will lead to a kinetic theory of matter.

Prof. Thomson then proceeded to show how this had been done in several ways, and explained the action of the kinds of apparatus used by means of models. He concluded by observed: "As a step toward a kinetic theory of matter it is certainly most interesting to remark that in the quasi elasticity, elasticity looking like that of an india-rubber band, which we see in a vibrating smoke ring, launched from an elliptical aperture, or in two smoke rings which were circular, but which have become deformed from circularity by mutual collision, we have in reality a virtual elasticity in matter devoid of elasticity and even devoid of rigidity, the virtual elasticity being due to motion and generated by the generation of motion."

Prof. Henry Enfield Roscoe, the President of the chemical section, made an address at its meeting, in which he reviewed the progress of the science between 1848 and 1884. The first date is that of the death of Berzelius. The second that of Dumas, the chemist. The differences between what the speaker called the Berzelian era and that with which the name of Dumas will be associated, show themselves, he said, in many ways, but in none more markedly than by the distinct views entertained as to the nature of a chemical compound. According to the older notions the properties of compounds are essentially governed by the qualitative nature of their constituent atoms, which were supposed to be so arranged, as to form a binary system. Under the new ideas, on the other hand, it is mainly the number and arrangement of the atoms within the molecule which regulate the characteristics of the compound, which is to be looked on not as built up of two constituent groups of atoms, but as forming one group. After discussing valency or the doctrine of atomicity, the speaker took up that interesting phase of organic chemistry known as orientation.

This brings up the question: Given certain compounds which possess the same composition and molecular formulæ, but varying properties, to find the difference in molecular structure by which such variation of properties is determined. Problems of this kind can now be solved satisfactorily, the number of possible isomers foretold, and this prediction verified by experiment. The general method adopted in such an experimental inquiry into the molecular arrangement or chemical constitution of a given compound is either to build up the structure from less complicated ones of known constitution or to resolve it into such component parts. In connection with this matter Prof. Roscoe remarked: "The discovery of aniline colors by Perkin, their elaboration by Hoffman, the synthesis of alizarin by Graebe and Liebermann, being the first vegetable coloring matter which has been artificially obained, the artificial production of indigo by Baeyer, and, lastly, the preparation by Fischer of kairine—a febrifuge as potent as quinine—are some of the well-known recent triumphs of modern synthetical chemistry. And these triumphs, let us remember, have not been obtained by any such 'random haphazarding' as yielded results in Priestly's time. In the virgin soil of a century ago the ground only required to be scratched and the seed thrown in to yield a fruitful crop. Now the surface soil has long been exhausted, and the successful cultivator can only obtain results by a deep and thorough preparation, and by a systematic and scientific treatment of his materials.

The great results of recent spectrum analysis, whereby, as to certain of the single elements, the connection between the spectra and molecular constitution can be traced, were then alluded to. "A further subject of interest to chemists," he went on to say, "is the theory of the vortex-ring constitution of matter thrown out by Sir William Thomson, and lately worked out from a chemical point of view by J. J. Thomson, of Cambridge. He finds that if one such ring be supposed to constitute the most simple form of matter—say the monad hydrogen atom—then two such rings must, on coming in contact with nearly the same velocity, remain enchained together, constituting what we know as the molecule of free hydrogen. So, in like manner, systems containing two, three and four such rings now become the dyad, triad and tetrad atoms. How far this mathematical expression of chemical terms may prove consistent with fact remains to be seen.

Thermo-chemistry was next touched upon, and then reference was made to the important discovery by Pictet and Cailletet of the liquefaction of the so-called permanent gases and of the establishment by Deville of the laws of dissociation. Before concluding his address Prof. Roscoe discussed the question of whether Englishmen were holding their own in the front rank, and he adduced reasons for believing that they were.

The attendance appears to have been specially good in the mathematical and physical science section, presided over by Sir William Thomson, and continuously attended by Lord Rayleigh, President of the association; the eminent astronomer, John Crouch Adams, of the Cambridge Observatory; Mr. J. W. L. Glaisher, Graham Bell, Admiral Ammen, Prof. O. J. Lodge, the eminent physicist; Profs. Schuster, Fitzgerald and Wolcott Gibbs and others of note. At their session on the 28th the very first paper brought much of the talent to the front in active discussion.

Prof. Lodge read a little paper calling attention to mooted points as to the seat of the electro-motive force in the voltaic cell. Its admirable presentation was such that Sir William Thomson publicly said he regarded the paper as a landmark on the subject. Then Sir William threw some light on the matter from his own observation and experience, and he was followed by Profs. Fitzgerald, Sylvanus P. Thompson, Dr. Fleming, Prof. Gibbs, and Drs. Schuster and Macallister. Mr. Preece, the head of the English telegraph system, came to the front in a discussion on a mathematical statement by Lord Rayleigh of the conditions necessary to use the Atlantic cables for telephone purposes, and Prof. Graham Bell sought for light on the subject. Mr. Preece, in the course of his remarks, ventured on the opinion that it was impracticable to use telephones with underground conductors for a distance greater than twelve miles.

In the chemical section, on the 28th, the most noteworthy paper was by Prof. Frankland, the well-known author, who took up the subject of the batteries for the storage of electrical energy. While admitting the great loss of power in these batteries when not in use, he was disposed to think from his experiments that they have a brighter future than many electricians are willing to admit. After him came Prof. George F. Barker, the American scientist, who has devoted himself especially to the subject. He called attention to the shortcomings of the batteries, which, according to his calculation, do not return over 6 per cent. of the energy put into them. Dr. Gladstone also spoke on the subject, but rather tentatively, as one waiting for results.

A curious suggestion was thrown out by Prof. O. J. Lodge in his lecture on "Dust," on the 29th, which has caused some discussion. This was to make use of static electricity in disposing of ocean fogs. The large engines on board steamships might be used to run great Holtz machines and the electric sparks be made to discharge from the mastheads. The electricity would coagulate the mist into globules of rain, which would fall.

Proposed American Electrical Exhibition at Boston.

As stated in these columns some time ago, it is proposed to hold an electrical exhibition in Boston. The exhibition will be held in the building of the Massachusetts Charitable Mechanics Association, Huntington Ave. It will begin on November 24th, and continue until January 3, 1885. Space and power will be furnished free, but each exhibitor will be required to pay an entrance fee of ten dollars. Exhibitors will be permitted to sell, but not to deliver goods during the exhibition except by special permission. All applications for space must be made by Nov. 1. The Advisory Board consists of Gen. A. P. Martin, Col. H. S. Russell, E. D. Jordan, Hon. P. A. Collins, J. M. Rodocanachi, Dr. T. A. Green, Hon. A. H. Rice, Col. C. H. Taylor, A. G. Tompkins and E. B. Phillips. P. H. Alexander is General Manager; E. W. M. Glenen, Business Manager; W. S. Hill, Superintendent; D. T. Tunayenis, Treasurer; B. F. Porter, Chief Clerk; and A. Luez, Comptroller. The object is "to show the rapid advancement that has been made in electricity, its methods and appliances, and all its possibilities and probabilities."

FORE AND AFT.—One of the uses to which it is proposed to put the locomotive electric headlight, we are informed by the president of a railroad, says the *Milling World*, is to have a second illuminator placed on the rear of the engineer's cab, throwing a flood of light over the train, and so arranged that it can be turned to the right or left and be made to illuminate the station grounds when the train is at a stand-still. This will be a grand improvement, which the traveling public will thoroughly appreciate.

Lighting a Swing Bridge.

The new bridge over the river at Rush street, Chicago, was formally opened to the public Aug. 7. Its construction and workings record an important epoch in the city's history, as it is operated by steam power in place of hand. The hitherto long, tedious and unnecessary delay to the general traffic will thereby be very materially lessened. One of the striking features in connection with its construction, says the Chicago *Journal of Commerce*, is that it is lighted by electricity, being, it is said, the first and only attempt in the world, at lighting a "swing" bridge by electric lights. At first thought this feature would not seem unusual, but there are several obstacles to overcome to render the attempt successful. When the bridge is "swung" all connection with the shore is cut off. To obviate this a house has been built in the centre of the bridge over the roadway, in which are placed steam boiler and engine for turning the bridge; also a separate engine for running a dynamo which feeds the lamps. The engine operating the dynamo is of ten horse-power, and is one of the New York Safety Steam Power Company's independent vertical steam engines, recommended for their great durability and noiseless operation. A circuit of copper wire connecting the lamps has been carefully constructed, everywhere insulated from the iron work. Two lamps are placed at each end of the bridge, and one on each side of the centre. These latter show red lights for signal purposes. Another obstacle to be met is that heavy teams cross the bridge four abreast, and are allowed to drive at full speed, which renders the jarring of the entire structure very great. This necessitates careful suspension and proper construction of the lamps. In meeting these difficulties the company furnishing the lights have been very successful. The lights are Thomson-Houston.

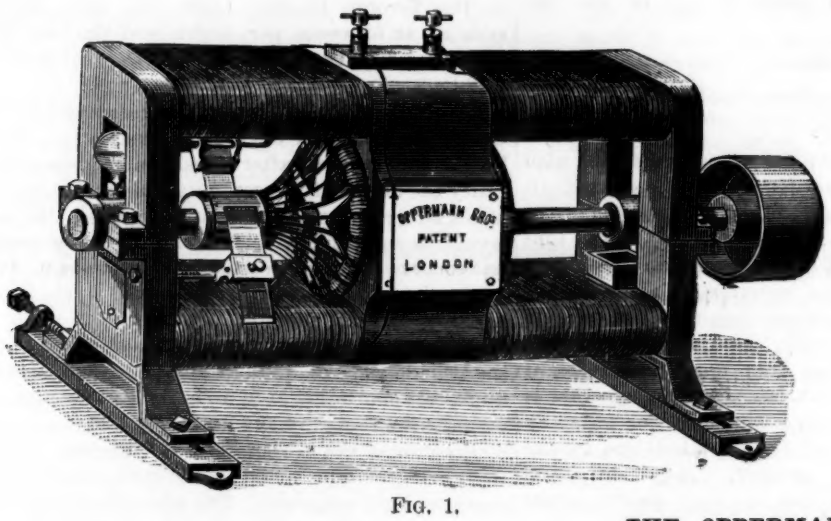


FIG. 1.

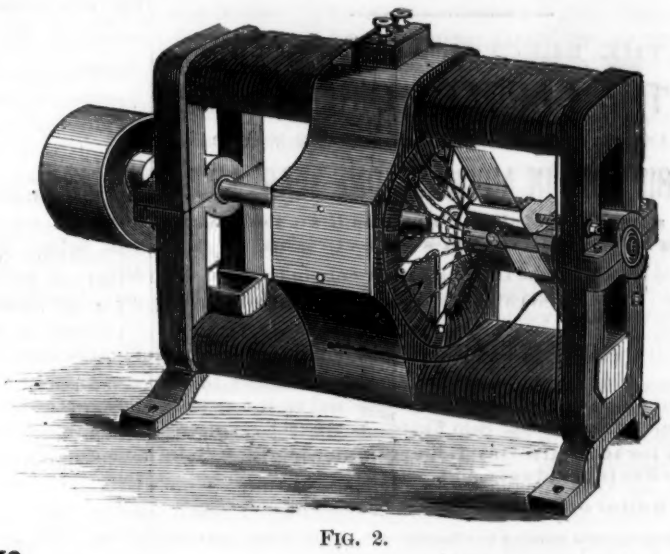


FIG. 2.

THE OPPERMANN DYNAMO.

The Oppermann Dynamo-Electric and Alternating Current Machines.

These machines have met with much favor in England.

Figs. 1 and 2 illustrate two types of the direct continuous current dynamos made by Messrs. Oppermann Bros. of London, England. The field magnets resemble those of the well-known Gramme machines; and are wound either in "series," "shunt" or "compound" to suit the requirements of use, or the desires of the purchaser. The armature is of the Pacinotti type rather than the Gramme. The core of the armature is built up of layers of thin sheet-iron disc-rings, insulated from each other by like disc-rings of insulating material. The combined discs form a ring-core which has 18 radially-projecting polar projections at equal circumferential distances apart. The spaces between the polar projections form 18 grooves within which the bobbins of insulated magnet wire are wound after the plan set down by Pacinotti and Gramme.

Bolts serve to fasten bronze spiders at each end of the armature to the core. The spiders are keyed or otherwise secured to the shaft.

The collector, commonly called commutator, is of the kind used with such winding.

Ventilation is secured by the construction of the armature, so that it may not overheat when run within practical limits of current.

These machines are useful for all the purposes for which dynamos are constructed, such as electro-plating, metal refining, arc and incandescence lighting, the charging of alternating current and other machines, etc., etc.

Fig. 3 illustrates one of the Oppermann alternating-current machines which has its field-magnets charged by one of the direct continuous current machines. The armature has no iron cores. The coils are somewhat sector-shaped, and consist of copper ribbon wound so as to have as much as possible in radial lines. The several layers are insulated from each other by ribbons of insulating material. The coils are connected at their ends with suitable contact cylinders insulated from but attached to the shaft.

Fig. 4 represents one of the Oppermann self-exciting, or self-charging, alternating-current machines. The charging armature of the type described hereinbefore is mounted on an extension of the shaft upon which the alternating current armature is mounted. The field-magnets extend from the sides of the alternating-current machine, parallel with the shaft, and the poles embrace the charging armature. The figure shows the construction plainly.

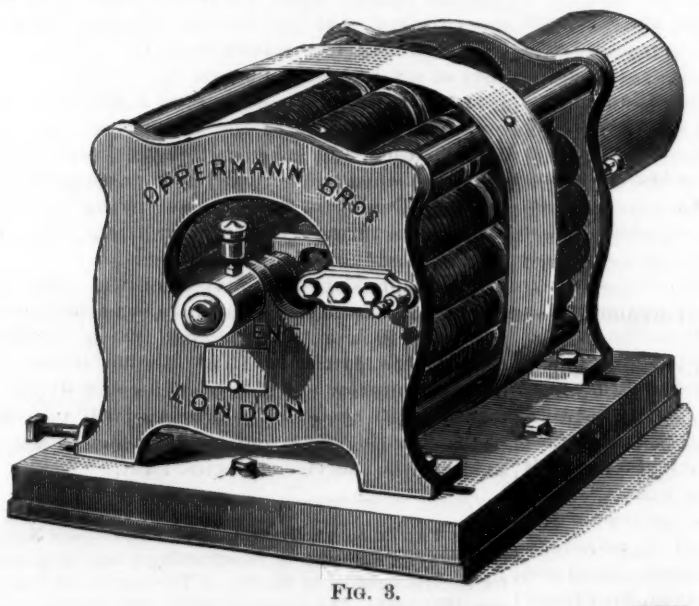


FIG. 3.

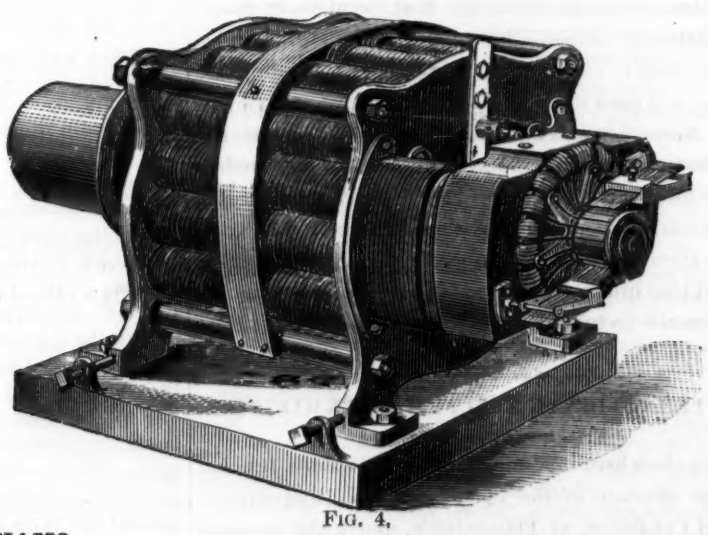


FIG. 4.

THE OPPERMANN DYNAMO.

The Messrs. Oppermann furnish us with the following particulars of one of these machines:

Total weight	600 pounds.
Floor space	18 × 18 inches.
Alternating current armature	16 inches diameter.
" " " rotations	1,100 per minute.
" " " weight	6 pounds.
E. M. F	50 volts.
Number of incandescence lamps	100
Candle power of each lamp	20
Ampères " " "	1.2
Charging current	12 ampères.
Power required	10 horse-power.

One of these machines supplying 300 lights is on exhibition at the International Health Exposition in London.

A 200-light machine will probably be on exhibition at the International Electrical Exhibition in Philadelphia, and also a smaller one. We will describe these machines in THE ELECTRICAL WORLD and give further and fuller particulars.

FAULTY WORK.—It seems as though enough care were not taken in some places in perfecting the circuits, hanging lamps, etc. We hear from a Southern city that a lamp hanging over one of the streets there fell very suddenly, and that a passer-by in a buggy escaped narrowly.

The Electric Light in Mines.

Probably the electric light has never been introduced in a place where its background has been so favorable in showing its vast superiority as an illuminating agent as in the Klamath River mines, in the extreme northern part of California. Heretofore pitchwood bonfires have been considered the only practical means of obtaining light in these mines, and they have always proved expensive and unsatisfactory. The Brush light was put in one of the mines this summer, and it soon demonstrated itself an indispensable factor to the successful working of the mines at night.

It is quite probable that the Brush, or other systems, will be adopted generally by all of the mines next season. A central plant, supplying several mines, is also talked of.

Pitchwood cost the present owner of the electric light from $1,200 to $1,500 per annum. The dynamo is operated by water power, and light may be said to cost nothing except for carbons and natural wear of machine. The two means of lighting, it is unnecessary to say, admit of no comparison in any way.

Worse than "Bulls" or "Bears."

Two years ago was published an account of a tiger raiding a telegraph office in India. To-day we chronicle the fact of a leopard executing a similar feat. Both cases are notable for the alacrity with which the operator climbed out the window without waiting to say "min" on the wire. The *Allahabad Pioneer* says: "A leopard was killed in the telegraph office at Bella Station on the Patna & Gya line at about 1 P. M. on the 21st ult. The station is situated about seven miles from the Barabear Hills, where these animals are said to abound. The creature evidently strayed into a neighboring village, whence being chased by the villagers, he got first into the station master's office and thence into the telegraph room. The peon on duty had the presence of mind to shut the door, which effectually confined the beast. Soon afterward the mail train arrived at the station and the driver of it shot him dead."

USES OF THE TOM THUMB LAMP.—The latest novelty in bouquets, newer even than pink water-lilies or blue hydrangeas, observes the New York *Sun*, was carried by the Princess of Wales at a ball after the races at Goodwood. It was of roses, and in the middle of it was concealed a miniature electric lamp, the light from which could be turned on at will, by means of a little switch in the form of a lady's brooch. Gentlemen's boutonnières are also so arranged as to contain an electric light. These, if they come generally into use, will deal a death blow to flirtations in dark places, as a passing friend has but to turn on his battery, and lo! forms and features are revealed with uncompromising distinctness. Paterfamilias will probably be a willing patron of the electric boutonnière, as he can thus not only follow up and drive away ineligibles and detrimentals, but can collect his scattered forces as the small hours approach, and gather them under his wings preparatory to departure.

THE
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Correspondence on all electrical subjects is solicited. Readers are cordially invited to communicate their views and opinions on all topics within the province of this journal. Items of information relating to any application of electrical science will be thankfully received. Our friends will render us a valuable service by forwarding news *promptly* as it occurs, and by mailing us marked copies of their local papers containing anything likely to interest our readers. Anonymous communications not noticed. Rejected manuscript cannot be returned unless accompanied by the necessary postage when received.

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A TRIAL TRIP.

From the beginning of the present month until the end of the year, THE ELECTRICAL WORLD will contain a large quantity of reading in regard to the great International Electrical Exhibition. It will give, as the present number indicates, elaborate illustrated descriptions of the exhibits a full account of the proceedings, reports of the meetings of the various learned societies, important papers by distinguished scientists, and all the electrical news of the day. The numbers of the papers during that period will therefore be extremely valuable for present use and future reference. In order to afford all an opportunity of reading the paper, we will send it for the four months of September, October, November and December, to any address in the United States or Canada, postage prepaid, for one dollar, or to any foreign country for $1.25. Subscriptions for this excellent trial trip should be sent in at once. We trust that our friends will call attention to this advantageous offer, and that orders will be sent in without delay, as we cannot promise to furnish full files or back numbers later on.

THE INTERNATIONAL ELECTRICAL EXHIBITION.

We give elsewhere in our columns this week a full and illustrated account of the opening of the International Electrical Exhibition at Philadelphia, under the auspices of the Franklin Institute. The ceremony was of an interesting character. The large attendance at the Exhibition throughout the week is a sufficient indication that the efforts of the Institute and of those who contribute to the great display will be crowned with abundant success, in a popular sense.

When complete, the exhibition will include about 2,000 exhibits, the majority of which are American. We do not know that many very startling novelties will be shown, but electrical science and electrical application will be amply exemplified as far as they have gone. Whatever is latest is there in telegraphy, telephony, electro-plating, electro-metallurgy, the transmission of power electrically, steam and gas engines for dynamo machines, and the thousand and one miscellaneous applications in the arts and sciences. Viewed, then, from a higher standpoint than the pleasing of temporary curiosity, the exhibition is a great success, presenting as it does comprehensively all that the philosophy of the scientist and the ingenuity of the inventor have been able to accomplish in electricity. The bibliographical and historical exhibits round out admirably the display of the manifold appliances to the demand for which there is no limit in this practical age.

Philadelphia during the present month will be the resort of several hundred of the scientific men of this country, affiliated with the American Association for the Advancement of Science, and of a great many members of the British Association, whose meetings at Montreal have been reported by us. The two Institutes of Mining and Electrical Engineers also meet in the city at this time, the Telephone Convention is to be held there, and the Railway Telegraph Superintendents intend also to hold a session while the Exhibition is open. Moreover, the National Conference of Electricians is to be held next week. It will be strange, indeed, if great good does not come out of the concentration at Philadelphia of all the electrical talent of this country and much of that of the Old World.

The Meaning of Sun Spots.

An interesting address, having a close connection with electrical science, was delivered on the 1st inst. at Montreal, before the mathematical and physical section of the British Association, by Prof. A. Schuster, of Owens College, Manchester, who led off the discussion on the subject of sun spots and their relation to terrestrial disturbances. He remarked that there was no question that sun spots do occur, and they occur periodically .The periodicity is not, however, regular. Sometimes they appear every eight years, and sometimes not for sixteen years. The period is about every eleven years. There is ground for believing that there are two periods of ten and a half and twelve years superposed on one another. Magnetic variations, that is variations of the magnetic needle, occur at such times, which are quite marked. The magnetic needle points to the north and the south. It does this, however, approximately. The magnetic needle follows the course of the sun somewhat. In the morning it begins travelling westward, and in the afternoon it starts on its run to where it began. This daily excursion of the needle is much greater when there are many spots on the sun. The proportion in England is as three to two, and in Germany as seven to four. At times, too, the needle travels irregularly to and fro. These needle vibrations are magnetic storms. The speaker referred to the noted storms of 1859 and 1872, at the time of the great outbursts on the sun, and said that if the sun were of solid steel, magnetized to the highest extent of which it is capable, it would not affect terrestrial phenomena to such an extent.

It was rash to say that the space between the earth and the sun did not contain sufficient matter to conduct electricity from one to the other, but leaving electric influence out of the matter, because we know nothing of the subject, we come to the question, "Does the sun radiate more or less at the time of the prevalence of sun spots?" This was not definitely ascertained. The trouble has been in trying to ascertain the sun's radiant heat, and we have not been able to get rid of disturbing factors, one of which is the variance in the absorption, reflection, etc., in the atmosphere at different times of the day. Prof. Schuster suggested the establishment of an observatory station on the Himalaya Mountains, about 20,000 feet above the level of the sea. He then pointed out the difficulties in the way of determining the solar heat and called attention to the thermic curves. During the period between 1810 and 1860 there was a remarkable correspondence between the mean temperature curves and the prevalence of sun spots in unusual numbers. The good wine years on the Rhine corresponded with the years of minimum sun spots. Hot summers follow after a period of maximum sun spots. Destructive cyclones on the Indian Ocean and around the West Indies, it has been observed, are greater in years of maximum sun spots. At the time of many sun spots there was seen a comparatively large number of comets around the sun. The speaker thought it not improbable that the periodicity of sun spots was produced in some way by meteoric streams whose orbits approached the sun at the times of the frequent sun spots.

The address was discussed learnedly, and further light was thrown on the subject by Profs. Balfour Stewart and W. Lant Carpenter, who took up the matter of short periods common to solar and terrestrial phenomena, and a learned report was submitted on meteoric dust. Other matters discussed were the measurement of solar radiation and recent progress in photographing the solar spectrum. The Earl of Rosse explained an electrical control for equatorial driving clocks.

Among the miscellaneous papers read on Sept. 2, but of which full reports have not yet come to hand, was one by Mr. J. Urquhart Mackenzie on the telemeter.

Mr. W. H. Preece has presented some most interesting facts in regard to electric lighting. He gave an account in his paper on domestic installations of the way in which he lights up his own house at Wimbledon with incandescent lamps, the dynamo for which is driven by a small gas engine. The engineer-in-chief of the plant is Mr. Preece's gardener, and when the lights are not burning the current in stored in Faure-Sellon-Volckmar batteries. Mr. Preece also described the way in which he lights up his little girl's doll's house with "Tom-Thumb" lamps, and he created some sensation by flashing a light on the audience from his scarf-pin, in which was fixed a miniature incandescent lamp.

We learn that Mr. Killingworth Hedges, one of the most promising English electricians of the modern school, has been invited to participate in the proceedings of the Electrical Conference, on his arrival at Philadelphia from Montreal.

Electric Lighting at Toronto, Canada.

A correspondent at Toronto, Can., writes us as follows:

On March 26 the tenders for lighting the streets with electricity were opened, when the bidders were found to be the Toronto Electric Light Co., using the Excelsior system, at 65 cents per night, and the Canada Electric Light and Mfg. Co., using the Van Depoele, at 62 cents per night.

The Fire and Gas Committee recommended the City Council to accept the bid of the Canada Co., as it was the lowest, but Council after considerable debate declined to ratify the action of the committee, as under the condition of the advertisement it was not compelled "to accept the *lowest* or any tender," as the Van Depoele system was unknown here and the Excelsior was well known. The following resolution was offered and adopted by the Council, and accepted by both companies:

"It is recommended that the Toronto Electric Light and the Canada Electric Light Companies be requested to set up twenty-five lights each, to be tested for a period of three months, the company not making the best showing to the satisfaction of the Corporation, to withdraw from the contract. The amount to be paid to both companies to be 62 cents per light per night. The test to be commenced on or before the 16th day of May next." Under the resolution quoted, each company started 25 lights on May 16th, the number having been since increased to 44 each. The test having expired on the 15th, a special meeting of Council was called for the 25th, when the matter was fully discussed, and the contract for 5 years awarded to the Toronto Electric Light Company, in accordance with resolution of Council of April 15th, which provided "that the company not making the best showing to the satisfaction of the Corporation, should withdraw from the contract."

This has been a great victory for the Toronto Co., as well as for the Excelsior system, and the unsuccessful competitors are feeling sore, and threatening the city with a law-suit, because it did not accept their bid, which was the lowest. What the result will be remains to be seen.

While on the subject it may be of interest to your readers to know that the Toronto Electric Light Co. have erected a very fine station here, the outfit of which consists of six Excelsior Electric Co. dynamos of a capacity of 130 lights; two Armington & Sims 50 h. p. engines; one 60 h. p. high speed Ide Engine; two steel boilers of 100 h. p. each, and safety switches for each circuit. The premises owned and occupied by the Company are 100 feet square. The upper floors are now being put in readiness for manufacturing dynamos and lamps. The Company now have circuits of over 30 miles.

To accommodate and provide for the additional lights required by the city, contracts are being prepared for two additional 60 h. p. engines, one 100 h. p. steel boiler, three 25-light dynamos and 100 double lamps. This will give the company one reserve engine and dynamo, which, together with their safety switches, will provide for all possible contingencies and enable them to guarantee an uninterrupted service of electric light.

THE VAN DEPOELE SYSTEM.—The Van Depoele Electric Light Company of Chicago is constructing a very large central plant for electric lighting in the city of Toronto, numbering something over 200 lights. The company having the plant in charge in that city has undertaken the construction of an electric railway which will be some four or five miles long, to be propelled by an electric motor of the Van Depoele system. It is alleged that with a train of six cars a speed of from 60 to 80 miles an hour can be attained. A local Chicago company is constructing a large central light station on the west side, for the purpose of illuminating the business houses in the vicinity of Madison and Halstead streets. The Van Depoele system will be used, and it is expected that at least 150 lights will be in operation by the middle of September.

TO HELP LIGHT NEW YORK.—The New York Steam Company broke ground on the 2d inst. at Washington square and Fifth avenue preparatory to laying pipe for steam along Fifth Avenue from the square to the Central Park, and also an ordinary gas pipe, which may be used for an electric wire cable, if the company sees fit to use it for that purpose. It has been rumored for some time past that the New York Steam Company has been intending to add electric lighting to the business of furnishing steam for heat and power. Mr. W. C. Andrews, the president of the company, when questioned on the subject, admitted that his company hoped within a year to have every house on Fifth avenue, from Washington square to the Park, heated by its steam and lighted by Sawyer-Man lamps, obtaining current from their dynamos. He says the company will furnish the light cheaper than gas.

(*Continued from page 78.*)

vincible power and made him sovereign of the Gods. Witness, in short, the poetry of all ages.

But electricity in this form was too wild and too mighty to be used by man in his efforts to subdue the earth. About the beginning of the present century, however, a tame variety of this force was discovered, in chemical electricity, and subsequent discoveries revealed to us magnetic electricity, which is now the most copious source of supply, and in this form it has been harnessed and made obedient to the will of man. It illuminates his path with a radiance excelled only by the surpassing glory of the sun. It carries his messages with a celerity which the boldest imagination has never dared to describe. It reverses the action of chemical affinity, and performs miracles in chemistry and metallurgy. In a thousand ways it serves the convenience and comfort of man, and by adding velocity to all his powers before possessed, it has increased immeasurably his capacity to execute the primeval command to subdue the earth.

The use of electricity is still in its infancy. We may not predict the future, but we may examine what is going on among us at present; and to this end the Managers of the Franklin Institute, thinking that the time had arrived when the present state of electrical science and the practical applications of it should be shown to the American people, have undertaken the present Exhibition. If any one desires to be fully informed on this head I would say to him, "Look around you."

We have invited the nations. They are here by their ambassadors, their commissioners, their philosophers, their artisans and their works. The electrical world of the United States is here fully represented; nay, it may be said, it is here *en masse*.

The Governor of Pennsylvania is present, and has kindly consented to open the Exhibition, and for that purpose we await the pleasure of his Excellency.

Mr. Tatham having concluded, Gov. Pattison was introduced. He was received with general applause. "Ladies and gentlemen," he said, "when I received the invitation extended to me by the management of this Exhibition to be present and participate in the opening exercises I cheerfully consented. Pennsylvania is particularly interested in the interests of this exhibition. In all the thousands of industrial enterprises that punctuate this State from one end to the other there is a practical illustration in some measure of the exhibitions which are to be found here. Pennsylvania, therefore, is to be congratulated upon the presence of this exhibition within her borders. Indeed, it ought to be a subject for international congratulation. Electrical science becomes of importance in this age because of its practical use in everyday life. It has a practical aim. The signs of the times are good for the progress of electrical science. They never were better in the history of the world than they are to-day. The speaker who preceded me pointed out to you its existence as discovered by Thales six hundred years before Christ, and Mr. Franklin discovered again the identity of electricity and lightning. Still these were but steps in electrical science. It remained for the discovery of the developments of electricity to be arrived at later on—the practicability of its application—for there soon followed the telegraph, followed by the telephone and then by electro-plating, and so, step by step, discoveries in electricity have been made; such discoveries belonging not to one age, nor to one people; such discoveries cannot be relegated to any particular place upon the globe. But here and there throughout the whole world the science, planting itself far back in the ages of the past, moves forward, creeping on step by step, moving on to the fullness of the time, step by step moving on to its completion. A hundred minds engaged in developments, it required a hundred years to bring it to perfection, until, in the fullness of time, in the perfect flower, in the ripened fruit, glorious genius appears upon the world's surface, and brings forward discovery to the verge of perfection. So it has been with electricity, and I may be pardoned in conclusion in reciting two lines which I think Pennsylvania on this occasion is entitled to—I refer to this:

> "'Nature and Nature's laws lay hid in night;
> God said "Let Franklin be!" and all was light.'

(Applause.) And so, my friends, upon this occasion, with submission to that Power that has been invoked at the beginning of these exercises, with submission to Him who is King of kings and Lord over all, with submission to Him who gave man dominion over the fish of the sea, fowl of the air, and the cattle and all the earth, in which is involved the sciences that are gradually creeping on in these modern times—let us go forward. The properties of matter which are yet to be discovered and the laws yet to be known and the usages of these properties and laws yet to be detected—let us trust in Him for them all. This is but the beginning of the entry into the rich storehouse of electrical science, and let us hope that this is the dawn of a new era. Great progress has been made in the past. Let us hope that the progress to come will be four-fold and ten-fold. With submission to Him, and by permission of the management of this Exhibition, I do declare the International Electrical Exhibition for the year 1884 open."

As the governor finished his speech the machinery was set in motion, and the fact that the Exhibition was open was also announced by the ringing of innumerable electric bells, and the playing of the great central fountain. Mayor Smith forwarded to the municipal authorities of Paris the following telegram: "Philadelphia congratulates Paris upon the opening of the International Electrical Exhibition. WILLIAM B. SMITH, Mayor."

The spectacle from gallery and floor was very brilliant throughout the day, and especially so at night. The utmost interest and the greatest curiosity were displayed by the thousands of visitors, and there can be no doubt that the exhibition will be a pronounced success. Incomplete as it now is, it offers many attractive features, and when complete, as it will probably be in about a week, the exhibition will be the most interesting, if not also the largest collection of electrical applications, ever made. Great praise is due for their unceasing exertions and unwearied courtesy, to the Director-General, Colonel C. H. Banes; Prof. E. J. Houston, the Electrician; Prof. W. D. Marks, the Superintendent; Dr. W. H. Wahl, the Secretary; Prof. M. B. Snyder, Chairman of the Board of Examiners; Mr. Carl Hering, the Assistant Electrician; Mr. G. W. Wilson, the Floor Manager; Mr. W. H. Roberts, the Manager of Boilers and Engines, and to the following chairmen of special committees: Mr. C. Bullock, on Space and Custom House Regulations; Mr. E. Lewis, on Transportation; Mr. P. E. Chase, on Classification; Dr. W. H. Wahl, on Correspondence and Publication; Prof. Houston, on Historical Electrical Apparatus; Mr. Isaac Norris, Jr., on Bibliography; Mr. F. Faley, on Finance; Mr. F. Graeff, on Buildings and Machinery; Mr. Coleman Sellers, on Rules and Regulations.

Last week we published the names of the gentlemen who had already consented to act as the Board of Examiners. We now give a list of the classes with their respective chairmen and secretaries:

Electric Telegraphs—Frank L. Pope, Chairman; Amos E. Dolbear, Secretary.

Dynamo-Electric Machines for Lighting—M. B. Snyder, Chairman; Carl Hering, Secretary.

Electric Motors for Transmission of Energy—Simon Newcomb, Chairman; F. C. Nipher, Secretary.

Electro-Dental Apparatus—J. Foster Flagg, Chairman; William Drysdale, Secretary,

Dynamo-Electric Machines for Miscellaneous Purposes—Joseph B. Murdock, Chairman; J. Burkitt Webb, Secretary.

Electric Conductors—1, Telegraph and Telephone Wires and Cables; 2, Electric Light and Power Circuits; 3, Submarine Cables—B. F. Thomas, Chairman, A. L. Kimball, Secretary.

Electro-Therapeutic Apparatus—Harrison Allen, Chairman; Roberts J Bartholow, Secretary.

Applications of Electricity to Artistic Effects and Art Productions—Frederick Graeff, Chairman; O. E. Michaelis, Secretary.

Apparatus for High Electro-Motive Force—1, Lighting protection; 2, Electro-static induction machines and induction coils; 3, Igniters—A. L. Kimball, Chairman; A. E. Outerbridge, Secretary.

Electro-signal and Registering Apparatus—William A. Rogers, Chairman; Mark W. Harrington, Secretary.

Voltaic-electro Apparatus—1, Voltaic batteries and accessories; 2, Polarization and storage batteries—F. C. Van Dyck, Chairman; William H. Green, Secretary.

Steam Engines—William D. Marks, Chairman; H. W. Spangler, Secretary.

Thermo and Magneto-electric Apparatus—S. P. Langley, Chairman; William A. Anthony, Secretary.

Gas Engines and other Prime Motors—J. Burkitt Webb, Chairman; Luigi D'Auria, Secretary.

Photometric Measurements—E. C. Pickering, Chairman; C. F. Brackett, Secretary.

Applications of Electricity to Musical Apparatus—Hugh Archibald Clarke, Chairman; Leonard Waldo, Secretary.

Instruments of Precision—Henry S. Carhart, Chairman; M. B. Snyder, Secretary.

Arc Lamps—William A. Anthony, Chairman; N. S. Keith, Secretary.

Dynamo-Electric Machines for Plating—C. F. Brackett, Chairman; B. F. Thomas, Secretary.

Telephones, Microphones and Radiophones—Charles A. Young, Chairman; C. E. Wead, Secretary.

Boilers—T. W. Rae, Chairman; Otto C. Wolf, Secretary.

Educational Apparatus—William H. Harding, Chairman; T. C. Mendenhall, Secretary.

Underground Conduits—Charles H. Banes, Chairman; William E. Geyer, Secretary.

Application of Electricity to Warfare—D. P. Heap, Chairman; Louis Duncan, Secretary.

Electro-metallurgy—Henry Morton, Chairman; Wm. H. Wahl, Secretary.

Dynamo-metrical Measurements—H. W. Spangler, Chairman; Gaetano Lanza, Secretary.

Incandescent Lamps—Charles R. Cross, Chairman; A. L. Kimball, Secretary.

Carbons for Arc Lamps—S. D. Sadtler, Chairman; C. B. Dudley, Secretary.

ATTACHING THE B. & M. CO.—On the 2d inst. a number of men employed by the Bankers' and Merchants' Telegraph Company obtained an attachment against the property of the company for three months' back wages, in Ohio.

Teaching the Young Idea.

Many efforts are being made in Philadelphia to turn the Electrical Exhibition to good educational uses. The Lecture Room in the annex will, during the six weeks of the Exhibition, be in continuous use. Forty lectures will be delivered to the public school children, boys and girls, who will be admitted at the rate of 15 cents each. For the purpose of stimulating them in the direction of understanding, as far as possible, the Exhibition and its objects, Director-General Banes has decided to offer 72 premiums, of $5 each, for the best essays by the school boys and girls on "What I Saw at the Exhibition." Bad spelling or bad grammar, will not, he says, interfere with the attainment o a prize. The boys and girls who have the best ideas and powers of observation and way of putting on paper what they hear and see will be the 72 who will be fortunate enough to carry off the $5 prizes.

A committee of twelve, six ladies and six gentlemen, all of them public educators, will be handed the essays, and will decide to whom the prizes shall go. The lectures to the children will all take place during the early part of the day. In the evening lectures will be given by distinguished men to visitors of mature years, and in all instances the lectures will be so illustrated as to give the auditors a thorough understanding of the subject under discussion. There will also be concerts in the evening, both in the lecture room and in the main building.

The Troubles of the B. & M. Company.

The representatives of the Baltimore & Ohio, Bankers' & Merchants' and Postal Telegraph companies discussed, on the 2d inst., at the office of the Bankers' & Merchants', No. 187 Broadway, means to be employed to assist the last-named company in its present straits. After the conference was over, Mr. Lawrence, of the Bankers' & Merchants', said that all the companies were in accord as to the necessity of carrying out the pooling agreement of Aug. 1., and that the embarrassments of the company would be relieved at an early day. D. H. Bates, president of the Baltimore & Ohio Company, said the rumors that the compact was to be broken were untrue, and that if any such disposition existed, which he denied, it was exceedingly doubtful if it could be done. Mr. Cummings, of the Postal, concurred in what Mr. Bates stated, and added that the compact would be adhered to and made stronger than ever.

Henry Rossner, Chairman of the Executive Committee of the Postal Company, said there had been no dissatisfaction among the companies, and that the talk about excluding the Bankers & Merchants' from the pool was absurd. It was true that owing to its financial troubles it had not been able to comply with the terms of the pool by furnishing its quota for the extensions ordered, but this was in process of settlement. If the two solid companies could not legally furnish the aid required, it was certain their individual stockholders would promptly come forward. No statement of the amount required could be obtained. A crowd of the unpaid clerks and operators of the Bankers' & Merchants' gathered about the doors of the main office and remained during the morning. In the afternoon they were informed they would receive their back pay some time this week.

WOOLEN MILLS, NEW ALBANY, IND.—The largest and finest woolen mills in the country west of Philadelphia are those at New Albany, Ind., and there has been considerable competition for the work of lighting them. The proprietors have now entered into a contract with the Brush Company, of Cleveland, who will furnish 275 incandescent lamps of 20 candle power each, to be run from a Brush dynamo direct. The order was secured by Mr. C. C. Curtiss, the General Agent of the Brush Company. The De Pauw Glass Works, also at New Albany, are using Brush arc lights with great satisfaction.

CHANGES IN TELEPHONIC MANAGEMENT.—At a meeting of the directors of the Erie Telephone Company held on Aug. 30 the resignation of Loren N. Downs, general manager, was accepted. The vacancy was not filled. The authority of the executive committee has been limited, and the company hereafter will be managed by the directors. Mr. Downs also resigned as general manager of the Union Telephone Company. D. W. Cowdrey, of Concord, N. H., has been elected general superintendent. It is rumored that a change will soon be made in the management of the New England Telephone Company.

LIGHTENING THE TOIL OF WOMEN.—The invention of the Stockwell Electric Motor seems likely, says the Boston *Manufacturers' Gazette*, to be of immediate and practical benefit to the many women in this city forced hitherto to toil with the needle for a living. The advertisement of the American Electric and Illuminating Company in the papers, headed "Electric Motors," only hints at the plan, which is in brief the establishment of a building, fitted up with improved sewing machines, each run with a Stockwell Motor, which will be let with power to sewing women at a nominal price, say twenty to twenty-five cents a day.

AN AUSTRALASIAN CABLE SCHEME.—Proposals have been made to the Hawaiian Government by an Australasian cable syndicate for the laying of an ocean cable from Brisbane, Australia, to San Francisco. The committee of the Hawaiian Legislature has submitted a report favoring the granting of a subsidy of $20,000 per annum for fifteen years, and a bill in accordance therewith was presented by the committee. It was promptly passed to a third reading and made a special order for August 18. No information of final action has yet been received. The Australasian syndicate propose to lay a cable between California and Queensland, communicating between and through the islands of Hawaii, Maui, Molakoi, Oahu and Kanai.

All About Meucci.

We have been asked by a great many readers lately to tell them all about Meucci, the alleged "first" inventor of the telephone. Information has been not very accessible, but we have given all we could get. We now quote the subjoined statement—for what it is worth—from the Philadelphia *Times* of Aug 26:

When the fact was made known in financial circles several months ago that Mr. Robert Garrett, president of the Baltimore & Ohio Railroad, and several other well-known millionaires, including James McHenry, of London, and Wm. H. Vanderbilt, of New York, were on the eve of entering the field against the gigantic telephone monopoly, many surmises were made as to the weapons which would be used to break the powerful grip that allowed this company to maintain its isolation in the market. The facts in the case, many of them having local origin, are varied and interesting.

About two years ago the average subscriber of the Bell Telephone Company in this city was dissatisfied with the service that was being given him and much talk passed between the company and its patrons. The outcome of these difficulties was a meeting of twelve hundred of the subscribers at the parlors of the Continental Hotel, in this city. Here a statement of the grievances was made and explanations were given by officials of the company, who claimed that the service was up to the average. The president of the meeting, W. W. Goodwin, suggested the appointment of a committee to draft a resolution asking of the Bell Company a specific statement of what the service would be in the future. No reasonable reply being made to these requests the committee met and concluded to see what could be done to improve matters.

About this time a young electrician, who had been in the employ of the Bell Company in New York, came to this city and reported that there was an old Italian, in Cuba, who could furnish conclusive evidence that he was the original inventor of the telephone, many years antedating Grabam Bell in the matter of filing his claims in the Patent Office at Washington. These reports, following the statements of other alleged "discoverers," were regarded as ridiculous, but the matter was placed in the hands of a party of legal men who made a thorough research covering many months. The result of their labor was astonishing, and verified the statements that had been made. About this time the matter was placed before Mr. Robert Garrett, who gave it over to his attorneys for investigation. They traced the alleged inventor, Antonio Meucci, to his home in Cuba, and from numerous disinterested parties learned the history of his invention, which was made in 1849. It was conclusively shown by their report, which was authenticated by hundreds of affidavits, that in 1849, while experimenting with electrical currents, he had discovered that the transmission of electric waves, set in motion through the medium of the human voice, was possible. Working upon this idea he, by slow degrees, and with a great deal of labor perfected the details of what was destined to be one of the most important inventions the world has ever seen.

The report goes on to show, and all the statements made are said to be matters of proof, that when the importance of the invention was made known to the inventor he obtained money enough to come to the United States, where he was to file his papers and models and reap the reward of his discovery. Upon reaching New York he placed the invention in the hands of a certain party, who was the president of a great telegraph corporation. The merits of the invention were talked over and arrangements were made by which the Italian was to leave his papers and models with the telegraph official, who was to have his electrical expert examine them and determine as to their value.

The matter here rested until 1871, when Meucci, fearing trouble with the parties who held his papers, appeared at the Patent Office at Washington and actually filed a caveat, in which he describes his invention as "sound telegraphing." This caveat was four times renewed, but owing to financial troubles letters patent were not issued to Meucci. Four years after Graham Bell filed a caveat and applied for patents, which he easily obtained. This latter caveat, it is claimed, bore a striking resemblance to the first in its specifications, and it is further alleged that Mr. Bell was the electrical expert of the telegraph company whose president had possession of the original models and papers of the Italian.

These reports being so well authenticated, a company was organized called the Globe Telephonic Company of America, with the following well-known capitalists as directors and stockholders: Robert Garrett, William Keyser, James Sloan, Jr., of Baltimore; Albert Pancoast, Philadelphia; Alan P. Smith, James McHenry, of London; William L. Scott, of Erie; D. H. Bates, John H. B. Latrobe and Howard Munnickhuysen, of Baltimore. The express purpose of the company was to purchase the interests of Antonio Meucci and the claims of a certain inventor, George E. Shaw, of Chicago.

This strong organization resulted in decisive steps. A sub-company was at once formed at Baltimore, with a capital stock of $1,000,000, and arrangements made for the establishment of a telephone exchange, which is already under way. A like sub-company, it is said, will soon be formed here and active steps taken to make competition in a telephonic way as active as the present telegraphic competition.

The McFall Combination Magneto Bell.

A meritorious novelty in the application of the magneto bell to telephone purposes is the invention known as the McFall Patent Combination Magneto Bell, introduced recently by the Standard Electrical Works, of Cincinnati, O., and now making its way into general favor. There are, we understand, about three hundred in use by the Cumberland Telegraph & Telephone Company, and the Great Southern Telegraph & Telephone Company. The chief features in connection with the bell are the privacy with which two intermediate stations can communicate with each other, without causing any disturbance to terminals; the time and trouble saved by not having private calls throw the drops on the switchboard; the adaptation of bells, specially toned, to each line, exchange or private; and the fact that continuity of circuit is not dependent on the contact points through the switch in this bell. The box is also availab'e with a private line when connection is desired with an exchange.

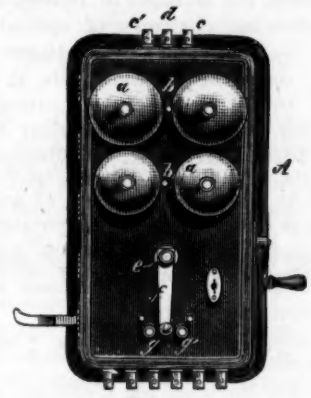


FIG. 1.

The two cuts we use herewith illustrate the principle and operation of the apparatus. Fig. 1 shows the front of the box, closed; Fig. 2 shows the box opened and the cover so thrown back as to bring all the details to view. The box *A* in Fig. 1 is of ordinary construction and arrangement; *a a* are two pairs of bells, and *b b* the hammers, operated by separate magnets *B B* seen in Fig. 2; *c c'* are the binding posts for connection of the line wire at each side, the posts being connected to the respective magnets *B B'* by the wires 1 and 2; *d* is the binding post for the ground connection, also connected by wire 3 to the pivot pin *e* of a switch arm *f*; the buttons *g g'* are connected with the telephone transmitter and magneto-generator by the wires 4 4, and connected also by wires 5 5 with the two magnets *B B.'* So much, then, for the parts. In the normal position, when the switch *f* is placed between the two buttons *g g,'* the main line is complete, as by placing the switch in the centre, the ground connection for the central station is removed, leaving only a ground at each end of the line, thus making a complete circuit from one end of the line to the other; so that, with the switch in the centre, any one of the three stations can call the others. Should the switch be turned to

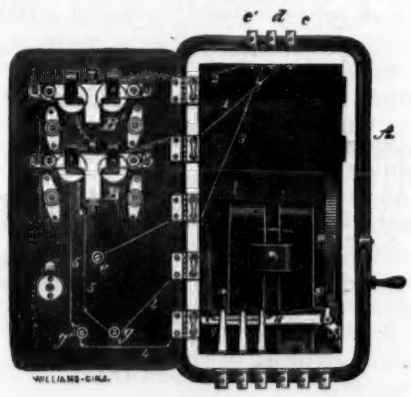


FIG. 2.

connect with either button and fail to effect contact, the circuit is not opened, nor are any of the stations prevented from calling, as it is then just the same as when left in the centre. Ground connection is made on turning the switch to either button, so that while communication is had with one side, the other side is not called up, the side to which it is turned being cut out. Nevertheless, the cut-out side is not prevented from calling or signaling to the central station, the bell to which that side is connected always remaining in the circuit of the side. Thus, with instruments known as 1, 2 and 3, if No. 1 wishes to speak with No. 3, notification is given to No. 2 to set switch in the centre, and the ground connection thus being removed from between them, Nos. 1 and 3 can converse. But should either of them desire to call up No. 2 it can be done, as the placing of the switch in the centre did not cut No. 2 out. In other words, the switch simply puts either side to ground, so that that side can be called without ringing the bell at the other side.

More could be said in explanation, but we have entered sufficiently into detail to give an idea of the special features of the invention. The McFall bell forms part of the exhibit of the Standard Electrical Works at the International Electrical Exhibition.

A Southern Telephone Exchange.

The telephone is an invention that suits Southern habits to a nicety. No one down South is greatly given to pedestrian exercises, so that whenever communication is required between persons in the same place, on pleasure or business, the telephone is wonderfully convenient as a saver of the legs. The Birmingham, Ala., *Chronicle* speaks as follows of the local exchange:

Just then the telephone bell rang, and this suggested the Telephone Exchange. Up three flights of steps are the airy apartments of the Bell Telephone Company. The energetic manager, Mr. W. L. Woodruff, sat in a neat office, with papers scattered over the table. The appearance of things indicated the refining presence of woman. The silence that reigned supreme induced the belief that she was absent.

"How many subscribers have you now?"

"Two hundred and twenty-five, and allowing five to the instrument this will make over one thousand persons using our telephone. This is a good showing for a city of 15,000. Here, I'll show you some figures. Washington, for instance, has a population of 160,000, and the telephone company has only 1,100 subscribers. If they had the same proportion that Birmingham has they would have 2,450. You will observe also that they have several instruments on one line. This never works as well as a single line. I remember once in the city I lived in before coming here, that an old lady had four daughters living in the town and she had them all connected by a single line. It was a family concern, so to speak. The wire was kept busy by this old lady and her daughters all day and a good part of the night. It was impossible to use it for other subscribers. There is only one line in this city that has three instruments on a circuit. You will notice that in Washington the prices are, for residences several on a wire $48, two on a wire $60, for direct wire to exchange $72; for business houses the rate of similar connections are $60, $80 and $100 respectively. Now in this city our charges are only $40 for residences and $60 for business houses. Excuse me a moment.

"That was a telegram from Pratt mines. We now receive telegrams and shoot them down into the telegraph office just underneath through this tube. You can see by the one just sent in from Pratt mines how convenient it is. A man can stand at this telephone and put himself in connection with the world."

The reporter started down the steps and caught a glimpse of the laboratory, work-shop and bedroom of the manager, all in close connection with the central office. Over the head of the manager's bed on the headboard under the net is a telephone, and he is kept in close communion with the heart throbs of the city by night as well as day. A fire alarm awakens him and he can ring the bell over the head of the City Hall keeper. The number of the ward in which the fire occurs can also be sounded. Number 148, the City Hall, is never rung after 6 o'clock in the evening unless there is a fire. Sometimes a false alarm is given, but unless the City Hall keeper leaves some one at the telephone while he is ringing the bell it cannot be corrected. The city is taking steps to perfect her fire department and soon we will have a Fire Exchange.

Edison on Electrical Applications.

"What is the latest thing in the application of electricity, Mr. Edison?"

"The funniest is the new process of making incandescent whiskey."

"What's that?"

"Well, that is whiskey, as my friend Amos Cummings would say, with the shiver taken out of it."

"How do they effect that with electricity?"

"Why, I am told that they let down the incandescent light into a barrel of whiskey, and in sixty-four hours they get all the flavor of old whiskey. The light and heat seem to act on the fusel oil somehow. I am told they make an excellent brand of whiskey out of 'rot gut?'"

"Have you tried it?"

"No."

"What is the most curious electrical phenomenon of late?"

"That is hard to say, there are so many. One of them is a live fish swimming in a tub of clean water, having swallowed a bait consisting of a little incandescent lamp. When the current is turned on the fish is lighted up so you can see through him and observe the circulation of the blood."

"What do you propose to show at the Philadelphia Electrical Exposition?"

"Only about ten per cent. of my stuff—but enough."

"Did you ever know of any practical use for the phonograph?"

"No, except as a curiosity. About all the colleges have them. I had to give it up for the electric light, where the field is immense."

THE WHISKEY-AGING PROCESS.—It is said that the fire underwriters have turned their attention to the so-called aging of whiskey by means of electricity, believing that the process is specially hazardous. By lowering an incandescent electric light into a barrel of liquid the age of the liquor can be materially and quickly increased, it is asserted, and the method is so favorably considered that permission to use it in some warehouses has been applied for; but the underwriters ask for time for experiments.

Arc Lights without Carbons.

BY JOHN R. SIMPSON.

A writer in a recent article wherein reference is made to the comparatively short time within which any great advance has been made in the arc lamp, suggests the adoption of some means whereby the carbon points may be abandoned, and the use of carbon in a solidified form dispensed with altogether.

This subject, as the writer seems to very well understand, is no new one, and has been considerably studied, though probably not with the earnestness that the probability of success justifies. The writer suggests the adoption for those points of some hard metal having the qualities of a conductor and cheap enough to be practicable, and refers to the fact that it is known that the air space through which a current of electricity will pass from one point to another is so short that if any such metal be used for the points it would instantly fuse; so in order to use such metal for the points the air space must be sufficiently increased to prevent the pointer fusing.

The importance of any invention whereby the use of the carbon points is dropped and the arc lamp made to retain all the advantages it now possesses, can only be understood when the cost of the carbon now consumed is known, and the expense connected therewith in the shape of labor employed in attending the lamps and in replacing the wasted carbons. A reasonable estimate of the cost of the carbon points consumed in the arc lamp generally in use is seven cents each night, and in a city of three thousand lamps, $210 per night or over $65,000 per year for carbons alone, and to this must be added the cost of labor in replacing the wasted carbons, which is fairly estimated at one and one-half cent per lamp per day, or for lamps for the same city nearly $15,000, making a total of $80,000 yearly.

The substitution for the carbon points of any material that will remain fixed must necessarily result in overcoming the very annoying breaks now so noticeable in the arc lamp, resulting from the wasting away of the carbons and the failure very often of the automatic devices for regulating the adjustment of the same.

A lamp that does not need the daily attention now given the arc lamp of to-day, could be used in many places difficult of access, such as church spires, high poles for city illumination, and other places where such a lamp would come naturally into use, and where the present arc lamp is not placed because it needs to be visited daily by an attendant.

The subject seems to have lately been discussed by the Society of Electricians of Paris, for in a paper read by M. Julius Martane, at its January meeting, the results of certain experiments were therein given, and which will no doubt be read by all interested in the subject. The suggestion in M. Martane's paper led me to experimenting. As a result of my experiments I am able to say that I believe it can be demonstrated that carbon in a solidified form can be done away with in the use of the electric arc lamp, and that the current of electricity can be assisted through an air space of sufficient distance to admit of the points being constructed of some cheap hard substance. As I desire to have made certain drawings, which I will not receive for some time, I will give the result of my experiments in a future paper. I think it a most important subject, and hope it may be taken up by some other of your readers. As the writer above referred to suggested the abandonment of the solidified carbon and made experiments in the line of such suggestion, the promised publication of the results of his experiments will be looked for with interest by those who have thought over the subject.

A Statement in Behalf of Western Union.

Special Agent Whitney of the Western Union Telegraph Company furnishes the following card to the press:

In the report given to the press generally by the Baltimore & Ohio Telegraph Company of the conference of representatives of the telegraph companies with the postmaster-general relative to fixing the rates for government telegrams for the current fiscal year, is the following: "In reply to a question Mr. Whitney stated that the government received the benefit of the lowest rates given by his company (the Western Union) to the public. This assertion was disproved by figures presented by both the postmaster-general and Mr. Bates," etc. This report is incorrect. My assertion was not disproved, and cannot be disproved. The postmaster-general did not claim that the Western Union charged more for government telegrams than for messages of the public. What he did say was that he thought the rates of his order of last year, which was then under consideration, would permit companies (not the Western Union particularly, but all companies) to charge more in some instances than was charged to the public, in reply to which it was stated that a proviso in the order itself stipulated that the government should not in any case be compelled to pay more than the public. Mr. Bates, who represented the United Telegraph lines, then stated that the Mutual Union lines had cut under the rates of his own company, and had offered to send messages for the public to Chicago for 20 cents, and gave that as an instance where the public had the benefit of lower rates than the government. I asked Mr. Bates if the Mutual Union company were not subject to government rates, and if the government did not get the benefit of the reduction. He said: "Oh, that is theory." I replied: "It is practice with us." That is the extent to which my assertion was disproved. The estimate that the government telegraphing amounts to $500,000 per year was made by Mr. Bates. When asked how he made it he said he "ascertained the amounts paid by all the departments at Washington, and jumped at the result." When asked how big a jump he made, he said: "He found the amount paid at Washington to be $170,000 (which includes all the telegraphing done for the Signal Service all over the country), and thought there would be enough more to make the half million." The statement that "the great bulk of the amount goes into the coffers of the Western Union Company at rates fixed by themselves," is notoriously untrue. For thirteen years the rates have been fixed by the postmaster-general. If the bulk of government business has been given to the Western Union, it is because government officers chose that channel for its transmission.

Telegraphers' Mutual Benefit Association.

The following are proposed amendments to the constitution and by-laws of the Association:

NEW YORK, Aug. 5, 1884.

The rapid growth of the Association within the past few years, the large increase of the "Reserve Fund," and the brilliant future which appears in store for the T. M. B. A., make necessary the adoption of every safeguard possible to insure honesty and economy in its financial management. To any one at all familiar with the work expected of the Auditing Committee, although its duties are not defined in the by-laws, except in a very general way, it is plainly apparent that without compensation neither the chairman, who, under the constitution, cannot be a resident of New York City, nor either of the other members, can be expected to devote the time necessary to the proper and essential checking of the books and accounts of the Association, and if this be delegated to a clerk, he is more than likely to be one from out of town, who is not a member of the Association, and who knows nothing of its affairs, and consequently cannot intelligently do the work without a thorough coaching, and this has to be repeated each year. In view of the foregoing, it has occurred to me that the interests of the Association will be best served by the election of an Auditor, whose duty it shall be to thoroughly audit all of the accounts of the Secretary and the Treasurer as to amounts due, collected and disbursed. I therefore propose the following amendments to the constitution and by-laws, viz.:

1st. Amend Section I. of Article III. of the Constitution so that it shall read, "The officers of the association shall consist of a president, a vice-president, a secretary, a treasurer and an auditor."

2d. Drop Section III. of Article III.

3d. Drop the words "and auditing" and the final "s" in "committees" in Section IV. of the same article, so that it shall read: "The officers and members of the Executive Committee shall be elected by ballot at each annual meeting," etc.

4th. Add to Section I. of the By-laws the following: "The auditor shall thoroughly examine and audit all of the books and accounts of the association, especially as to the amount which should be accounted for, and as to the authority for disbursements and payment of death claims, also as to membership and the issue of certificates either new or duplicates. He shall have access at all times to all the records. He shall report quarterly in writing to the Executive Committee, and shall also submit a written report to each annual meeting."

5th. Drop from Section II. all that portion relating to the Auditing Committee.

6th. Add to Section IV.: "And an appropriation shall be made to the auditor for clerical services in his department at each annual meeting."

Respectfully submitted,
(Signed) SAMUEL M. TAYLOR,
(and 26 others).

THE TELEGRAPH.

EVANSVILLE, IND.—The District Telegraph Company at this place appears to be doing well in securing patrons. Construction begins at once. Everybody who subscribes now is given a share of stock.

THE TELEPHONE.

TELEPHONE RIVALRY IN NEWARK.—Vice-Chancellor Van Fleet, at Newark, granted an injunction on Aug. 30, restraining the New York & New Jersey Telephone Company from using the Bell telephones in the city of Newark and the townships of Harrison and Kearney, and from obstructing or interfering with the Domestic Telegraph & Telephone Company. The order was granted at the instance of the Domestic Telegraph & Telephone Company. This company uses the Bell telephones. The New York & New Jersey proposed to use the same telephones, and to establish a rival exchange in Newark.

THE ELECTRIC LIGHT.

THE BRUSH IN BOSTON.—The Brush Electric Light Company, of Boston, has been in operation now about three years. They are operating two stations in that city; one is situated at No. 5 Lancaster street, and the other is at Mayo's Block, near Dover street, at South End. They have decided to concentrate their business, and will build a new station on Ferdinand street, near the Providence Railroad Station. They will commence at once to erect a large building for dynamo-electric machines, boilers and engines, and will lay out for a capacity of 1,000 electric lights. They closed a contract last week with the Jarvis Engineering Company of that city for five 150 H. P. Armington & Sims' engines. They were the first electric arc light company to use this make of engine, but it has now been adopted by all the other electric light companies. The new station of the Brush Company will be a model one, and will contain all the modern improvements in the way of economy in making steam.

A NOVEL OBJECTION.—Captain Philip, Inspector of Lighthouses for the Twelfth District, which includes all of the California coast, has had called to his attention the electric light upon Telegraph Hill, San Francisco, and the proposition for the city to place an electric light mast on the hill. Pilots have expressed the opinion that the Telegraph Hill lights might delude incoming shipmasters. Telegraph Hill is 294 feet high; Russian Hill is 360 feet. From some points of nautical observation, therefore, the present Telegraph Hill light might not be seen, notwithstanding that it is elevated considerably above the hill. But from many other points it is plainly visible. The apparent difficulties arising from electric lights in this location seem to be first that electricity is uncertain, and that the light is allowed to fall before lighthouse beacons are extinguished; and next, that should, by any chance, when fog envelops the lights at Point Bonita and Fort Point the electric light be seen, it might be mistaken for at least the fixed white light at Point Bonita. It would closely correspond also with the fixed white light at Alcatraz. A vessel coming from Liverpool or New York, or from some some nearer point, might be enough out of its bearings for the master to be misled. The electric light might, in fact, become a false beacon. The difficulty is increased much by the uncertainty of the light, according to mariners. It cannot be placed on charts for a bearing, for when looked for it might not be found. The liability to be seen when other lights are hid is illustrated by the common appearance of Mount Tamalpais and lesser peaks above the fog when other less elevated points are invisible. Capt. Philip will take a launch and go outside of the Heads to inspect. As yet he declines to express any opinion.

MISCELLANEOUS NOTES.

SALT LAKE CITY PROSPECTS.—It is proposed to run an electric railway along Second South street, Salt Lake City, instead of the cable road hitherto thought of. Negotiations have already been entered into with Messrs. Knight & Bentley, of Cleveland, O., by local parties.

OIL EXCHANGES.—A new rule has been adopted at a meeting of the New York Petroleum Exchange, providing that all exchanges in the "Conference" shall not connect by telegraph or telephone with any oil exchange not a member of the Conference. If two-thirds of the other exchanges adopt this resolution, it becomes law.

THE RESISTANCE OF GLASS.—Messrs. T. Gray, A. Gray, and J. J. Dobbie, of Glasgow University, have been investigating the electrical resistance of various kinds of flint glass, as made by different makers, with a view to find out the relations existing between the resistance and the chemical constitution of the glass. The tests were made by immersing flasks of the glass in mercury and filling up the interior with mercury. The mercury formed electrodes to convey the current from 120 Daniell cells through the glass; and the resistance was measured by a high resistance astatic galvanometer. They found that the resistance of the glass increased with the percentage of lead in the glass, and also with the density, but diminished as the percentage of alkali in the glass increased. The best specimen tried contained over 40 per cent. of lead oxide, and had a density of 3.141. Its specific resistance at a temperature of 130 deg. Cent., was $8,400 \times 10^{10}$ ohms between two opposite faces of a centimetre cube. The experiments show that the resistance of glass is halved by an increase of about 8½ deg. Cent. This rule holds for a considerable range of temperature, hence the approximate resistance of glass at a certain temperature may be estimated. In taking the temperature observations, the glass flasks were heated by means of a sand bath.

IN OPPOSITION TO FRANKLIN.—As a matter of course, the new doctrine of Franklin and his allies was not received without considerable opposition. A sharp shock of an earthquake having been experienced in Massachusetts in 1755, this was forthwith attributed to the evil influences of Franklin's lightning rods. A Boston clergyman preached against them in 1770 as "impious contrivances to prevent the execution of the wrath of Heaven." Even as late as 1826 an engineer in the employment of the British Government recommended that all lightning rods should be removed from public buildings as dangerous expedients, and in 1838 the Governor-General and Council of the East India Company ordered that all lightning rods should be removed from public buildings, arsenals and powder magazines throughout India, and only became reconciled to their restoration after a large magazine and corning house, not furnished with a conductor, had been blown up during a storm. Franklin was so much in earnest in reference to his invention that he sent a friend at his own charge through the principal towns of the New England States to make known the powers and virtues of the lightning rod. In the "Poor Richard" for 1758, a kind of almanac or manual which he was at that time publishing, he gave specific instructions for the erection of his rods. The second conductor which he himself constructed was placed upon the house of Mr. West, a wealthy merchant of Philadelphia. A few months after this had been erected a storm burst over the town and a flash of lightning was seen to strik the point of the conductor and to spread itself out as a sheet of flame at its base. It was afterward found that about two inches and a half of the brass point had been dissipated into the air and that immediately beneath the metal was melted into the form of an irregular, blunt cap. The house, nevertheless, was quite uninjured. The sheet of flame seen at the base of the conductor Franklin correctly ascribed to the ground having been very dry and to there not having been a sufficiently capacious earth contact under those circumstances. He nevertheless shrewdly, and quite justifiably, assumed that in this case nature had itself pronounced an unmistakable verdict in favor of his invention.—*The Edinburgh Review.*

THE AMERICAN INSTITUTE FAIR.—The Board of Managers of the American Institute of New York have already commenced arrangements for their fifty-third annual exhibition, which will be opened on Sept. 24 next, at the Institute Building, Third avenue and 64th street. The building is undergoing a thorough course of repair, and many improvements will be made which will be conducive to the comfort and convenience of both exhibitors and visitors. It is the intention of the management to make the fair, if possible, more popular than that of last year, which was the most successful ever held. Judging from present indications there is every reason to believe that the coming exhibition will be more than usually attractive, instructive and interesting, for a larger number of applications for space have been received this year, up to date, than has previously been the case, and among these are promised many new and effective novelties in the various departments into which the exhibits are divided. These divisions are seven in number, and are "Fine Arts and Education; The Dwelling; Dress and Handicraft; Chemistry and Mineralogy; Machinery; Inter-communication; and Agriculture and Horticulture." These departments, it may be mentioned, are subdivided into seven groups each; each group having three judges who examine all the articles on exhibition and make a report thereon to the Board of Managers, recommending such awards as they may adjudge due, and upon these reports the managers act. Manufacturers, designers, inventors and others desirous of placing their products before the public at the coming fair should without delay send on their applications for space to Mr. Charles Wager Hull, the general superintendent, at the office of the Institute, 22 Cooper Union, New York, as "first come, first served" is the motto that rules, and it should also be borne in mind that early entries greatly facilitate classification, and as a general thing secure the intending exhibitor more ample and suitable space and location than might otherwise be the case. In this connection it will perhaps be interesting to many to know the conditions under which the awards are made. They are as follows: The medal of honor (gold) is awarded only for an article or process which shall show a marked improvement on those previously in use, and be considered of the highest importance in science and the arts. It is awarded on the recommendation of three judges, approved by a majority of the Board of Managers and confirmed by a majority of the Board of Trustees. The special medal (silver) is awarded only for an article of great importance and extraordinary merit. This medal may be offered for a certain number of exhibits in each year, a list of which shall be prepared by the Board of Managers. The Medal of Taste (silver) is awarded for any article or process which is considered of unusual excellence in the first four groups of the department of Fine Arts and Education. The Medal of Superiority (bronze) is awarded for an article or process of great value. The Medal of Excellence (bronze) for articles or processes of importance, and the Medal of Merit (bronze) for articles or process of acknowledged merit. In addition to these, diplomas are granted to employés who, by their skill, add to the attractiveness of the exhibition; and awards are made for the best skill and workmanship by apprentices. Awards are also made to exhibitors of perishable products in money or other valuable consideration. The entrance fee to exhibitors is the same as in former years, viz., $10, but there is no charge made for space. The entrance fee also gives the exhibitor the right of admission to the building for himself and employé.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, the Boston Exchange and elsewhere are as follows:

TELEGRAPH.—Am. Cable, b 52½, a 56½; B. & M., a 18; Mutual Union, b 14½, a 15½; Postal sixes, b 35; Western Union, b 63⅝, a 63½.

Since the suspension of the firm of A. W. Dimock & Co., a few months ago, the Bankers & Merchants' Telegraph Company has been having a hard time of it financially. Mr. Dimock had not only been president of the company, but he was the moving spirit in the rapid and comprehensive work of extension which was designed to rank the Bankers & Merchants' Company among the most formidable of the Western Union's rivals. It now appears that the new company tried to grow too fast, and with Mr. Dimock's personal financial embarrassment came an abrupt end of the telegraph company's outward prosperity. Construction bills came in that could not be paid, and soon the company found itself involved in litigation. After a while the Postal Telegraph Company took the Bankers & Merchants' under its wing, and both companies entered into a pooling agreement with the Baltimore & Ohio Telegraph Company by which the lines of the three companies should be operated under one executive head for 25 years, from Aug. 1, 1884.

This pooling contract required that each of the three contracting companies should do certain things, already stated in these columns, in the way of completing extensions then under way, or else making certain prospective improvements. It is now stated that the Bankers & Merchants' Company has not been able to live up to the letter of the contract in this respect, and that consequently the two other companies are dissatisfied. It has even been reported in Wall street that the Baltimore & Ohio people were inclined to exclude the Bankers & Merchants' for its failure to perform its part of the agreement. The officers of the last-named company were not disposed to talk about the affairs of that corporation. They said there was nothing new and that matters would come out all right.

Reports were received by telegraph in several down-town offices this week that some of the western offices of the Bankers & Merchants' Company had been seized by the sheriff's officers to satisfy judgments; also that the Western Union has been taking an inventory of the effects of the B. & M. Co.

TELEPHONE.—American Bell, b 157; Erie, b 20½; Mexican, a 1⅜; New England, a 26; Tropical, a ½.

Bell telephone has been dull at 157, as the general business depression weighs heavily upon the output of instruments. The net gain for the month ended Aug. 20 was the smallest of late, if not of any record, being only 616. The net gain by months since the beginning of the fiscal year bears this comparison with 1883:

	1883.	1884.
Month ended March 20	4,739	3,252
Month ended April 20	7,342	4,483
Month ended May 20	6,758	5,023
Month ended June 20	7,038	4,568
Month ended July 20	5,846	2,278
Month ended Aug. 20	3,569	616
Total, six months	35,292	20,220

ELECTRIC LIGHT.—American, b 9; Edison, b 90, a 95.

BUSINESS NOTICES.

CONSOLIDATED TELEPHONE CO.—We call attention to the advertisement of the Consolidated Telephone Co. in this issue. Scientists from abroad will be pleased to note the remarkable development of the acoustic telephone in this country. We understand there will be an exhibit of the instrument at the Philadelphia Electrical Exhibition.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

Edited by N. S. KEITH, Electrical Engineer and Expert, 9 Murray Street, New York.

PATENTS DATED AUG. 19, 1884.

Automatic Circuit Closer for Telegraph Keys; A. A. Stoneburner & J. H. Kasper, of Dyer, Ind..... 303,956

A disc, hinged on the arm, is above the button. When operated the pressure of the finger moves the disc downward onto the button, and thus lifts a levered-spring contact from circuit. When pressure is removed the contact is made again by reason of the spring attached to the disc.

Clip for Aerial Electric Cables; A. Wright, of Providence, R. I..... 303,961

A combination of sister-hooks, a loop and band to pass around a cable, and by which it may be suspended.

Device for Laying Conductor-Wires in Underground Conduits; W. Pyle, of Wilmington, Del. 303,749

It consists in the introduction of an endless or practically endless pilot-wire within the conduit, which wire is mounted upon or passes over reels or pulleys journaled in brackets secured to the sides of the man-holes located at suitable distances apart and connecting with the conduit, whereby said pilot-wire may be caused to move forward by simply turning the reel or pulley in the proper direction, and thus carry the conductor-wire, thereunto attached, through the conduit-section between the man-holes.

Dynamo-Electric Machine; J. Olmstead, of Brooklyn, N. Y..... 303,744

Consists of details of construction and combination of parts having for their object the permission of circulation of air through the armature, and the prevention of Foucault currents in the armature core.

Electrical Cable; F. P. Duplain, of Chicago, Ill. .. 303,924

The cable consists of the several insulated conductors twisted together and then bound with a wrapping of fibrous insulating material. The whole may then be manipulated for drawing into a tube without kinking.

Electrical Call Device; W. P. Curl, of Ardmore, Pa., and J. H. Curl, of Elwood, N. J..... 303,626

An arrangement of devices under which an operator of an electric call may be notified in response to his call.

Electrical Conductor; C. T. Jackson, of New York City..... 303,735

Two conductors in ribbon form are placed with their edges parallel, but separated between two wider strips or ribbons of paper glued or pasted together. One of the outer sides of the paper may be gummed so as to be readily fastened to a wall or ceiling.

Electric-Arc Lamp; E. Thomson, of Lynn, Mass... 303,762

Consists in mounting the globe-holder on a telescope extention-support depending from beneath the support for the lower or negative carbon, which support may be held up or closed by suitable catches or locking devices, so that the globe shall surround the carbons, and the parts shall be closed together and out of the way, or may be extended or drawn out to lower the globe below the plane of the carbons.

Electric Lamp; E. Boettcher, of Leipsic, Germany.. 303,614

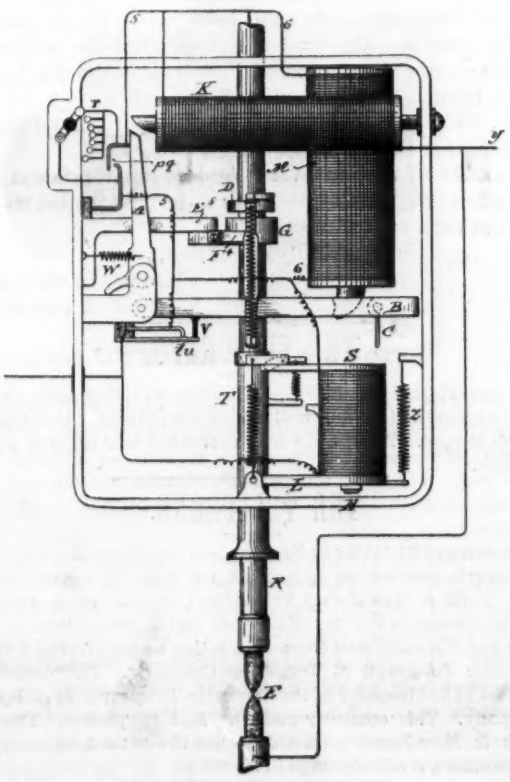
A lamp in which both carbons move, and their reduction in weight from consumption is compensated by links of chains lifted from their beds.

Insulator-Supporting Bracket for Electric Wires; C. Neblett, of Cincinnati, O..... 303,877

Consists in the provision of a horizontal arm having one of its ends upturned to form a standard upon which the insulator is secured, and at its other end provided with perforated arms or straps which are pivotally attached thereto, so as to adapt the device to be secured upon the corner of a chimney, or against the flat face thereof, or upon any angular, flat, or other portion of a building. It also consists in providing, in connection with the insulating-supporting arm and its pivotal strap-attaching arms, an inclined brace-rod, which brace is secured to the horizontal arm at its upper end, and to the corner of the chimney or other structure at its lower end.

Electric-Lamp Mechanism; E. Thomson, of New Britain, Ct..... 303,898

The parts are shown supported in the interior of an iron frame or box, the carbon-rod R passing vertically through its centre. An electro-magnet M, traversed by the circuit current or direct current is arranged so as to attract an armature B. By the upward and downward movements of the armature B a clamp D D' is lifted or lowered. This clamp serves to seize the carbon-rod R and establish an arc when lifted, and to allow said rod to slip through it when lowered. An arm C connects the armature B to a dash-pot, or other check-motions, as may be preferred. The electro-magnet K of high resistance is a shunt or derived circuit around the arc, and the variations of its power, acting in opposition to a spring W upon its armature A, serve to close or open a set of contacts p q, which constitute a shunt of small resistance around coils of M, so as by shunting current from such coils to weaken the magnet's power. The shunt-wire around magnet M is indicated by the numeral 5, and the wire which includes magnet M and is shunted is indicated by the numeral 6. A small resistance-coil or resistance r, is provided partly as a preventive of spark during the closing and opening of the contacts p q. This resistance is connected to the branch 5 at the points indicated, so as to form a circuit for the current in 5 around said contacts. When the contacts are open, the branch 5 is a shunt of high resistance around 6 and the magnet M, but when the contacts are closed the resistance is cut out. The resistance r is used for a novel purpose. By changing its amount, as by changing its length or size of wire composing the coil, or the material of the coil, or by otherwise changing the resistance of r in any manner, the operator is enabled to adapt the power of the lifting maguet to varying strengths of current used to operate the lamp without changing the winding of the magnet M as to size of wire, convolutions, etc. The device for adjusting the resistance consists of the well-known arrangement of a switch moving over a series of contacts connected to the resistances at various points, whereby a greater or less length of the resistance may be included in the circuit 5 around the magnet M.



Regulator for Dynamo-Electric Machines; J. W. Langley, of Ann Arbor, Mich..... 303,866

An improvement on patent No. 265,519, of Oct. 3d, 1882.

Regulator for Fluid-Motors for Dynamo Electric Machines; H. L. G. Clérac & P. G. R. Guérolt, of Paris, France..... 303,620

The positions of the valves of the motors are determined by the movement of connected belts, effected by electro magnets, which are operated by changes in the currents of electricity, generated by the dynamos run by the motors.

Speaking Telephone Transmitter; T. J. Perrin, of New York City..... 303,941

Details of construction to enable the transmitter to work without the rattle incident to the effects of loud noises.

System for Transmitting and Distributing Electrical Energy; W. A. Shaw, of Brooklyn, N. Y..... 303,891

Consists in a combined system of batteries (secondary) and conductors.

Telephone; A. F. Congdon, of Philadelphia, Pa..... 303,809

A coil is placed between the polar arms of a horseshoe magnet and another coil is placed over or around the combined poles.

Telephone; D. Drawbaugh, of Eberly's Mills, Pa.... 303,629

Consists in a receiving telephone having a diaphragm of membrane, to which an armature is attached, and an electro-magnet adjustably placed with its poles facing the armature, and a tension spring to regulate the tension of the diaphragm.

Telephone-Exchange System and Apparatus; H. H. Eldred, of New York City..... 303,714

Consists of a central or exchange station, which is connected with a number of sub-stations by means of telegraphic or telephonic lines radiating therefrom, these latter being so organized and arranged that any two of the sub-stations may be placed at a moment's notice in direct telegraphic or telephonic communication with each other by the act of an attendant at the central or exchange station, who, upon being notified to do so, connects together the two lines leading to the respective sub-stations, so that they are enabled thereafter to communicate with each other directly.

Telephone Transmitter; D. Drawbaugh, of Eberly's Mills, Pa..... 303,627

A construction of telephone transmitter in which there are three electrodes, two rigidly attached to elastic bars or plates, and the third resting loosely upon the inclined faces of the others.

Telephone Transmitter; D. Drawbaugh, Eberly's Mills, Pa..... 303,628

A construction of telephone transmitter in which there are three electrodes employed—two fixed, and one resting upon the two by gravity.

Transmitting Telephone; A. F. Congdon, of Philadelphia, Pa..... 303,810

Consists of improvements in the construction of transmitting telephones of the class in which the vibrations of a diaphragm cause variations of resistance in an electrical battery circuit through the primary wire of an induction coil, the secondary wire of the latter having the receiving telephone in circuit, as more fully described.